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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* HOWARD E. RHODES

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Appeal 2008-2881  
Application 09/172,298  
Technology Center 2800

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Decided:<sup>1</sup> February 24, 2009

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Before EDWARD C. KIMLIN, ADRIENE LEPIANE HANLON, and  
LINDA M. GAUDETTE, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* EDWARD C.  
KIMLIN.

Opinion Concurring in the result filed by *Administrative Patent Judge*  
ADRIENE LEPIANE HANLON.

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<sup>1</sup> The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

## DECISION ON APPEAL

This is an appeal from the final rejection of claims 1-4, 7-15, 18-23, 25-29, 31-39, 41-63, 65 and 115-144. Claim 1 is illustrative:

1. An imaging device comprising:
  - a substrate;
  - a photosensitive area within said substrate for accumulating photo-generated charge in said area;
  - a photogate for controlling the accumulation of photo-generated charge in said photosensitive area;
  - a first and a second gate stack;
  - a first insulating layer in contact with said substrate and beneath each of said first and second gate stacks; and
  - a nitrogen containing second insulating layer distinct from said first insulating layer, said second insulating layer being in contact with said substrate and being located beneath said photogate.

The Examiner relies upon the following references in the rejection of the appealed claims:

Koike	4,143,389	Mar. 6, 1979
Suzuki	4,385,307	May 24, 1983
Okada	5,241,198	Aug. 31, 1993
Nagasaki	5,307,169	Apr. 26, 1994
Anagnostopoulos	5,804,845	Sep. 8, 1998

Appellant's claimed invention is directed to an imaging device comprising a substrate, a photosensitive area within the substrate, a photogate which controls the accumulated charge in the photosensitive area, and a first and second gate stack. Also, a first insulating layer is in contact with the substrate beneath the first and second gate stacks. In addition, a nitrogen containing second insulating layer is in contact with the substrate

beneath the photogate. The appealed claims recite that the nitrogen containing second layer is distinct from the first insulating layer.

Appealed claims 1-4, 7-13, and 120 stand rejected under 35 U.S.C. § 102 as being unpatentable over Anagnostopoulos. The claims also stand rejected under 35 U.S.C. § 103(a) as follows:

(a) claims 1, 3, 7, 14, 15, 18, 19, 26, 28, 29, 31-33, 38, 39, 41, 42, 44, 46, 51, 53, 55, 57-59, 115-125, and 135-139 over the admitted prior art and Nagasaki,

(b) claims 2, 4, 25, 27, 43, 45, 54, 56, 126-134, and 140-144 over the admitted prior art, Nagasaki and Koike,

(c) claims 2, 8, 10, 11, 20, 22, 23, 25, 34, 36, 37, 43, 47, 49, 50, 54, 60, 62, and 63 over the admitted prior art, Nagasaki and Suzuki,

(d) claims 1-4, 7-15, 18-23, 25-29, 31-39, 41-63, 65, 115-125, and 135-149 over the admitted prior art, Nagasaki and Okata, and

(e) claims 126-134 and 140-144 over the admitted prior art, Nagasaki, Okata, Anagnostopoulos, and Koike.

We have thoroughly reviewed each of Appellant's arguments for patentability. However, we are in complete agreement with the Examiner that the claimed subject matter is unpatentable over the cited prior art. Accordingly, we will sustain the Examiner's rejections for the reasons set forth in the Answer and we add the following primarily for emphasis.

We consider first the §102 rejection over Anagnostopoulos. Appellant's principal contention is that Figures 3A-3C show only one insulation continuous with the substrate and, therefore, do not describe the claimed "first insulating layer in contact with said substrate and beneath each of said first and second gate stacks" and "a nitrogen containing second

insulating layer distinct from said first insulating layer, said second insulating layer being in contact with said substrate and being located beneath said photogate”. However, we agree with the Examiner’s analysis that, in the absence of a specific definition in Appellant’s Specification that the claim term “distinct” requires that the insulating layer cannot be in contact with an adjacent insulating layer of the same material, it is reasonable to consider insulating layer 36 under layers 34, 35, and photogate 30 to be distinct from layer 36 under electrode 32. When the claim language “distinct” is given its broadest reasonable interpretation, as it must, we find no error in the Examiner’s rationale that “an insulating layer beneath an electrode 30 is perforce spatially distinct from an insulating layer beneath an electrode 32, even if those layers are subportions of a greater layer” (page 9 of Answer, 1<sup>st</sup> para.). As set forth by the Examiner, “[c]laim 1 does not specify how the ‘second’ layer is distinct from the ‘first’ layer apart from being beneath the ‘photogate’ rather than beneath the ‘first and second gates stacks.’” *Id.*

Appellant separately argues claims 9 and 13 which recite that “said nitrogen containing layer is ONO”. Appellant argues that “[i]n Fig. 3B, Anagnostopoulos teaches an ONO insulating layer, but not being ‘distinct from first insulated layer,’ as required by the claim because the ONO is the only insulating layer” (page 11 of Brief, last para.). However, for the reasons set forth above, we agree with the Examiner that insulating oxide layer 43 under photogate 30 is spatially distinct from oxide layer 43 under electrode 32. Furthermore, as pointed out by the Examiner, Appellant does not discuss reference Fig. 3A “in which ONO layer 35, 34, 36 ‘beneath said

photogate' 30 is clearly 'distinct from said first insulating' layer 36 'beneath' electrodes 32" ( page 9 of Answer, 1<sup>st</sup> para. ).

We now turn to the §103 rejection over the admitted prior art in view of Nagasaki. Appellant does not dispute the Examiner's factual determination that the imaging device of the admitted prior art, depicted in Figures 1 and 2 of the present Specification, comprises all the recited elements with the exception of an insulating nitrogen containing layer located beneath the photogate. Nagasaki, on the other hand, evidences that both silicon oxide and silicon nitride were conventional materials for use as a photogate insulator. Since silicon nitride is taught to have a higher dielectric constant than silicon oxide, we agree with the Examiner that it would have been obvious for one of ordinary skill in the art to employ silicon nitride as an insulating layer beneath the photogate of the admitted prior art for the purpose of increasing the capacity of the pixel and the dynamic range (see Nagasaki at col. 2, ll.17-27). Although Appellant stresses that Nagasaki prefers using insulating materials having a higher dielectric constant than silicon nitride, such preference does not undermine the obviousness of selecting silicon nitride for one of its known uses as an insulating layer. We find that one of ordinary skill in the art would have found it obvious to select the particular material for the insulating layer based on a number of factors, such as cost, availability, and the desired capacity for a particular imaging device. We also note that Anagnostopoulos evidences that it was known in the art that silicon nitride "because of its higher index of refraction, compared to  $\text{SiO}_2$ , improves the light transmittance both through the polysilicon and ITO gates" (col. 3, ll. 43-45).

Appellant also maintains “Nagasaki teaches the use of a photodiode 8 as a ‘light receiving surface,’ not the claimed photogate” (page 16 of Brief, last para.). However, Appellant has not rebutted the Examiner’s finding that “Figures 3 and 6 show a transparent photogate electrode 21”, or the Examiner’s finding that Figure 6 of Nagasaki shows “insulating film 4 beneath photogate electrode 21 while silicon dioxide insulating film 22 is beneath gate electrode 6” ( page 10 of Answer, second paragraph ).

As for the § 103 rejection that includes Koike, we agree with the Examiner that the reference evidences the obviousness of using polysilicon, tin oxide and indium oxide for a transparent or semi-transparent electrode, and at Figure 2 the reference teaches “the photogates insulator 21 and electrode 22 disposed at least in part over the adjacent gate electrode 18” (page 11 of Answer, 1<sup>st</sup> para.). It is not necessary for a finding of obviousness that Koike teaches the formation of a photogate electrode over a nitrogen containing insulating layer.

Appellant also makes the argument that Suzuki teaches an imaging device utilizing SSD technology as opposed to CMOS technology of the admitted prior art. However, Suzuki is additional evidence that it was well known in the art to use an insulating layer beneath a photoelectrode comprising silicon nitride and silicon oxide to attain a higher dielectric constant compared to the use of silicon oxide alone. Also, Appellant has not rebutted the Examiner’s finding that “[t]he present claimed photogate” corresponds to photoelectrode 14 of Suzuki (Figure 2), transparent electrode 21 of Nagasaki et al. (Figures 3, 6) and photogate 24 of acknowledged prior art Figure 1”( page 10 of Answer, last sentence ).

As a final point, we note that Appellant bases no argument upon objective evidence of nonobviousness, such as unexpected results, which would serve to rebut the obviousness of utilizing a nitrogen containing insulating layer beneath a photogate. Nor has Appellant proffered evidence of unexpected results with respect to any of the claimed features.

In conclusion, based on the foregoing and the reasons well stated by the Examiner, the Examiner's decision rejecting the appealed claims is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(v).

AFFIRMED



HANLON, *Administrative Patent Judge*, concurring in the result.

I join the majority opinion with the exception of the decision affirming the Examiner's rejection of claims 1-4, 7-13, and 120 under 35 U.S.C. § 102 as anticipated by Anagnostopoulos. In particular, I respectfully disagree with the majority that Anagnostopoulos describes "a first insulating layer" and "a nitrogen containing second insulating layer distinct from said first insulating layer" as recited in claim 1.

Claim 1 recites, in relevant part:

a first insulating layer in contact with said substrate and beneath each of said first and second gate stacks; and

a nitrogen containing second insulating layer distinct from said first insulating layer, said second insulating layer being in contact with said substrate and being located beneath said photogate.

App. Br. 25, Claims Appendix.<sup>2</sup>

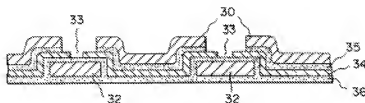
The Examiner relies on Anagnostopoulos Figures 2A, 3A, 3B, and 3C in the §102 rejection on appeal. *See* Final 2-3<sup>3</sup>; Ans. 3.<sup>4</sup> In the Answer, the Examiner focuses on Figure 3A which is reproduced below:

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<sup>2</sup> Appeal Brief dated February 8, 2007.

<sup>3</sup> Final Office Action dated August 18, 2004.

<sup>4</sup> Second Supplemental Examiner's Answer dated November 15, 2006.



**FIG. 3A**

Anagnostopoulos Figure 3A depicts an electrode structure.

The Examiner maintains that the claimed first insulating layer reads on the oxide layer **36** and the claimed nitrogen containing insulating second layer reads on the ONO layer (i.e., layers **36, 34, 35**). Final 2-3; Ans. 3. The Examiner explains that the ONO layer **36, 34, 35** “beneath said photogate” **30** is *distinct* from the oxide layer **36** “beneath” electrodes **32**. Final 3; Ans. 9. Thus, *distinctness* is based on the location of layer **36** on the substrate, i.e., beneath photogate **30** or electrodes **32**.

The Appellants, on the other hand, argue that Anagnostopoulos Figure 3A shows only one layer contiguous with the substrate. For this reason, the Appellants argue that Anagnostopoulos does not teach “a first insulating layer in contact with said substrate” and “a nitrogen containing second insulating layer distinct from said first insulating layer” also in contact with the substrate. App. Br. 9-10.

Anagnostopoulos Figure 3A shows alternating ITO electrodes **30** and polysilicon electrodes **32** and an ONO stack formed by nitride layer **34**, top oxide layer **35**, and bottom oxide layer **36**. Anagnostopoulos 5:1-3. As illustrated in Anagnostopoulos Figure 3A, bottom oxide layer **36** is a continuous layer and is the only layer in contact with the substrate.

Based on this disclosure, it is reasonable to find that Anagnostopoulos describes one continuous insulating layer in contact with the substrate (i.e., layer **36**), not two distinct insulating layers as required by claim 1.

The majority explains that in the absence of a specific definition of the term “distinct” that excludes adjacent insulating layers of the same material, “it is reasonable to consider insulating layer 36 under layers 34, 35, and photogate 30 to be *distinct* from layer 36 under electrode 32.” Decision on Appeal 4 (emphasis added).

Based on the record in this appeal, I agree with the majority that the claim term “distinct” does not exclude two adjacent insulating layers of the same material. For example, claim 1 does not exclude two insulating layers of the same material that are deposited at different times and/or different temperatures. That being said, I respectfully disagree with the majority that layer **36** comprises two distinct insulating layers as required by claim 1.

Layer **36** is a single, continuous layer that extends along the length of the substrate, beneath both photogate **30** and electrodes **32**. See, e.g., Anagnostopoulos 5:1-3, Fig. 3A. Therefore, whether layer **36** is considered to be a single oxide layer or part of the ONO stack, layer **36** is nonetheless one continuous layer.

Furthermore, in my opinion, the majority’s interpretation of the term “distinct” reads the following phrase out of claim 1: a second insulating layer “being *located beneath* said photogate.” App. Br. 25, Claims Appendix (emphasis added).

All words in a claim must be given meaning. *Exxon Chemical Patents Inc. v. Lubrizol Corp.*, 64 F.3d 1553, 1557 (Fed. Cir. 1995); *In re Sabatino*, 480 F.2d 911, 913 (CCPA 1973) (“Claim limitations defining the

subject matter of the invention are never disregarded.”). Thus, to anticipate claim 1, Anagnostopoulos must describe a second insulating layer that is in contact with a substrate and is distinct from the first insulating layer for some reason other than its location beneath photogate **30**. The Examiner has failed to point to such an anticipatory disclosure in Anagnostopoulos.

For the reasons set forth above, I respectfully disagree with the majority that Anagnostopoulos describes two distinct insulating layers as recited in claim 1. At best, the two “layers” identified by the majority and the Examiner are *distinct portions* of the same layer **36**. Thus, I would reverse the rejection under §102 based on Anagnostopoulos.

tc

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